IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Peter Larsson, *et al.*	§	Group Art Unit:	2151
		§		
Application No.	10/596,586	§	Examiner:	Greene, Joseph L.
		§		
Filed:	06/16/2006	§	Confirmation No:	8104
		§		

Attorney Docket No: P18804-US1
Customer No.: 27045

For: Fast/Opportunistic Distributed Resource Reallocation For Established Connections In A Multihop Network

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APPEAL BRIEF SUBMITTED UNDER 35 U.S.C. §134

This Appeal Brief is submitted to appeal the decision of the Primary Examiner, set forth in Final Official Action dated June 22, 2009, 2009, finally rejecting claims 8-23, and the Advisory Action, dated September 10, 2009, maintaining the claim rejections.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §41.20(b)(2), and to credit any overpayment, to Deposit Account No. 50-1379.

Real Party in Interest

The real party in interest, by assignment, is: Telefonaktiebolaget LM Ericsson (publ)
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Related Appeals and Interferences

None.

Status of Claims

Claims 1-7 and 24 were previously cancelled and are not appealed. Claims 8-23 remain pending, each of which are finally rejected and form the basis for this appeal. A copy of claims 8-23, as amended to date, are submitted herewith in the Claims Appendix.

Status of Amendments

The claims set out in the Claims Appendix include all entered amendments. No amendment has been filed subsequent to the final rejection.

Summary of Claimed Subject Matter

Claim 8	Specification Reference
8. A method for optimizing the performance of a connection between a source node and a destination node in a multihop network, said method comprising the steps of:	Figure 2; Page 8, *et seq.*
transmitting a beacon containing a measure of performance for the connection from at least one active node associated with the connection between the source node and the destination node;	Step 202; Page 8, line 11, *et seq.*
receiving at least one of the transmitted beacons at least one neighboring node associated with the connection between the source node and the destination node;	Step 204; Page 9, line 16, *et seq.*
calculating at said at least one neighboring node a cost function based on the measure of performance in each received beacon;	Step 206; Page 9, line 25, *et seq.*
determining at said at least one neighboring node whether the cost function for the connection between the source node and the destination node can be improved if said at least one neighboring node adapts at least one resource in the multihop network; and	Step 208; Page 10, line 5, *et seq.*
if yes, adapting the at least one	Step 210; Page 10, line 11, *et seq.*

resource to improve the cost function for the connection between the source node and the destination node; or	
if no, maintaining the at least one resource in the connection between the source node and the destination node.	Step 212; Page 1, line 13, *et seq.*

Claim 16	**Specification Reference**
16. A wireless multihop network that implements a reactive routing protocol to optimize the performance of a connection between a source node and a destination node, said wireless multihop network comprising:	Figure 1, Page 5, line 2, *et seq.*
at least one active node located in the connection between the source node and the destination node, wherein each active node transmits a beacon containing a measure of performance for the connection between the source node and the destination node; and	Figures 1 and 2; Page 8, line 11, *et seq.*
at least one neighboring node associated with the connection between the source node and the destination node, wherein each neighboring node receives at least one of the transmitted beacons, calculates a cost function based on the measure of performance in each received beacon, and adapts at least one resource in the wireless multihop network if it is possible to improve the cost function for the connection between the source node and the destination node.	Figures 1 and 2; Page 9, line 16, *et seq.*

<u>Grounds of Rejection to be Reviewed on Appeal</u>

1.) Whether claims 8-23 are anticipated by Cain (U.S. Patent Publication No. 2003/0204625).

<u>Argument</u>

1.) Claims 8-23 are not anticipated by Cain (U.S. Patent Publication No. 2003/0204625).

The Examiner has maintained the rejection of claims 8-23 as being anticipated by Cain (U.S. Patent Publication No. 2003/0204625). The Applicants traverse the rejections.

It is to be remembered that anticipation requires that the disclosure of a single piece of prior art reveals <u>every</u> element, or limitation, of a claimed invention. Furthermore, the limitations that must be met by an anticipatory reference are those set forth in each statement of function in a claims limitation, and such a limitation cannot be met by an element in a reference that performs a different function, even though it may be part of a device embodying the same general overall concept. Whereas Cain fails to anticipate each and every limitation of claims 8-23, those claims are not anticipated thereby.

Claim 8 recites:

> 8. A method for optimizing the performance of a connection between a source node and a destination node in a multihop network, said method comprising the steps of:
>
> transmitting a beacon containing a measure of performance for the connection from at least one active node associated with the connection between the source node and the destination node;
>
> <u>receiving at least one of the transmitted beacons at least one neighboring node associated with the connection between the source node and the destination node</u>;
>
> <u>calculating at said at least one neighboring node a cost function based on the measure of performance in each received beacon</u>;
>
> <u>determining at said at least one neighboring node whether the cost function for the connection between the source node and the destination node can be improved</u> <u>if said at least one neighboring node adapts at least one resource in the multihop network</u>; and
>
> if yes, adapting the at least one resource to improve the cost function for the connection between the source node and the destination node; or
>
> if no, maintaining the at least one resource in the connection between the source node and the destination node. (emphasis added)

The Applicants' invention is directed to a reactive routing protocol for optimizing the performance of a connection between a source node and a destination node in a multihop network. The protocol is characterized by the **transmission of a beacon containing a measure of performance for the connection from at least one active node associated with the connection between the source node and the destination node**. The beacon is received by one or more neighboring nodes, which can adapt a resource (*e.g.*, route, channel, physical layer parameters) of the multihop network if it is possible to improve a cost function, calculated by the neighboring node based on the measure of performance in each received beacon, for the connection between the source node and the destination node. That combination of elements is not taught by Cain.

As noted in Applicants' response to the office action dated October 6, 2008, Cain discloses methods for adapting an ad-hoc wireless network. Cain is concerned, in general, with the grouping of nodes (11) into clusters (12). In response to node or link failures, the method taught by Cain is used to determine a new route between source and destination nodes. Cain, however, does not disclose: 1) the transmission of a beacon containing a measure of performance for a connection from at least one active node associated with the connection between a source node and a destination node; 2) wherein the beacon is received by a neighboring node, which then calculates a cost function based on the measure of performance in each received beacon; and 3) the neighboring node adapting a resource of the multihop network if it is possible to improve the cost function for the connection between the source node and the destination node. The transmission of a beacon containing **a measure of performance for a connection**, **rather than mere knowledge of the proximity of nodes/clusters**, allows for any neighboring node to cause the adaptation of resources to optimize a connection between source and destination nodes.

With respect to the claim elements "transmitting a beacon containing a measure of performance for the connection from at least one active node associated with the connection between the source node and the destination node" and "receiving at least one of the transmitted beacons at least one neighboring node associated with the

connection between the source node and the destination node," the Examiner has referred to paragraph [0053] as teaching both claim limitations, asserting that "the data/message that node k transferred to node m that contained information about its metric is the beacon." The Examiner mischaracterizes the teachings of Cain. As the title of Cain indicates, the teachings thereof relate to performing reactive routing "using ad-hoc on-demand distance vector routing (AODV)." (emphasis added) As described in paragraph [0053], that involves adapting routing paths due to "topology dynamics induced by node and link failures," as well as "link additions." Node and link failures cause "nodes [ ] [to] become *further away* topologically," while "link additions tend to make nodes [ ] become *closer together* topologically." (emphasis added) Thus, the routing mechanisms described by Cain seek to respond to changes in topological **distance** between nodes. **In contrast**, the mechanism of Applicants' invention seeks to respond to changes in **performance** between nodes; the invention using a beacon that contains a "measure of performance" between one or more nodes between source and destination nodes. In response to such changes in performance, a cost function is computed from which it can be determined whether to adapt at least one resource to improve the cost function between the source and destination nodes. **That functionality is not taught by Cain**.

In responding to Applicants' arguments in the Advisory Action, the Examiner merely states that:

> ". . . the broadness of the claim language allows that many different things could be a measure of performance. For example: the transmission that allows one computer to know that the other node is no longer operating."

The Applicants wonder how a node that "is no longer operating" would make such a transmission. If a node is no longer operating, it does not have any "performance" to indicate. More importantly, however, the Applicants do not claim the transmission of a beacon that indicates the performance of a node. Rather, the Applicants' invention recited in claim 8 is directed to a method for optimizing the performance of a connection between a source node and a destination node in a multihop network, wherein the claimed beacon contains "a measure of performance for the connection from at least one active node associated with the connection between the source node and the

destination node." Cain fails to disclose the use of any such beacon, much less a beacon used in the manner recited in claim 8; therefore, that claim is not anticipated thereby.

Whereas independent claim 16 recites limitations analogous to those of claim 8, it is also not anticipated by Cain. Furthermore, whereas claims 9-15 and 17-23 are dependent from claims 8 and 16, respectively, and include the limitations thereof, they are also not anticipated.

CONCLUSION

The claims currently pending in the application are patentable over Cain and the Applicants request that the Examiner's claim rejections be reversed and the application be remanded for further prosecution.

Respectfully submitted,

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CLAIMS APPENDIX

1-7. (Cancelled).

8. (Previously Presented) A method for optimizing the performance of a connection between a source node and a destination node in a multihop network, said method comprising the steps of:

transmitting a beacon containing a measure of performance for the connection from at least one active node associated with the connection between the source node and the destination node;

receiving at least one of the transmitted beacons at least one neighboring node associated with the connection between the source node and the destination node;

calculating at said at least one neighboring node a cost function based on the measure of performance in each received beacon;

determining at said at least one neighboring node whether the cost function for the connection between the source node and the destination node can be improved if said at least one neighboring node adapts at least one resource in the multihop network; and

if yes, adapting the at least one resource to improve the cost function for the connection between the source node and the destination node; or

if no, maintaining the at least one resource in the connection between the source node and the destination node.

9. (Original) The method of Claim 8, wherein each active node performs the receiving step, the calculating step, the determining step, the adapting step and the maintaining step.

10. (Previously Presented) The method of Claim 9, wherein said at least one resource includes:

a route;

a channel; or

one or more physical layer parameters.

11. (Original) The method of Claim 9, wherein said adapting step includes inserting at least one of the neighboring nodes into the connection between the source node and the destination node and removing at least one of the active nodes from the connection between the source node and the destination node.

12. (Original) The method of Claim 9, wherein said adapting step includes removing at least one of the active nodes from the connection between the source node and the destination node.

13. (Previously Presented) The method of Claim 8, wherein said adapting step is performed when there is a topology change within the multihop network, said topology change includes:

a movement of one of the nodes;

one or more quality variations in a channel between the source node and the destination node;

one or more changes in traffic patterns within the multihop network;

one or more changes in transmit patterns within the multihop network; or

one or more changes in resource allocations within the multihop network.

14. (Original) The method of Claim 8, wherein said at least one neighboring node adapts the at least one resource of the multihop network in an opportunistic manner in response to an instantaneous topology change in the multihop network.

15. (Previously Presented) The method of Claim 8, wherein each beacon includes a general broadcast part and a connection related part that contains the measure of performance which includes:

an accumulated cost for the connection between the source node and the destination node; or

a maximum allowed power for the transmitting active node.

16. (Previously Presented) A wireless multihop network that implements a reactive routing protocol to optimize the performance of a connection between a source node and a destination node, said wireless multihop network comprising:

at least one active node located in the connection between the source node and the destination node, wherein each active node transmits a beacon containing a measure of performance for the connection between the source node and the destination node; and

at least one neighboring node associated with the connection between the source node and the destination node, wherein each neighboring node receives at least one of the transmitted beacons, calculates a cost function based on the measure of performance in each received beacon, and adapts at least one resource in the wireless multihop network if it is possible to improve the cost function for the connection between the source node and the destination node.

17. (Original) The wireless multihop network of Claim 16, wherein each active node performs the receiving step, the calculating step and the adapting step.

18. (Previously Presented) The wireless multihop network of Claim 16, wherein said at least one resource includes:

a route;

a channel; or

one or more physical layer parameters.

19. (Original) The wireless multihop network of Claim 16, wherein said adapting step includes inserting at least one of the neighboring nodes into the connection between the source node and the destination node and removing at least one of the active nodes from the connection between the source node and the destination node.

20. (Original) The wireless multihop network of Claim 16, wherein said adapting step includes removing at least one of the active nodes from the connection between the source node and the destination node.

21. (Previously Presented) The wireless multihop network of Claim 16, wherein each neighboring node performs the adapting step when there is a topology change within the wireless multihop network, said topology change includes:

a movement of one of the nodes;

one or more quality variations in a channel between said source node and said destination node;

one or more changes in traffic patterns within the wireless multihop network;

one or more changes in transmit patterns within the wireless multihop network; or

one or more changes in resource allocations within the multihop network.

22. (Original) The wireless multihop network of Claim 16, wherein each neighboring node performs the adapting step in an opportunistic manner when there is a real-time topology change within the wireless multihop network.

23. (Original) The wireless multihop network of Claim 16, wherein each beacon includes a general broadcast part and a connection related part that contains the measure of performance which includes:

an accumulated cost for the connection between the source node and the destination node; or

a maximum allowed power for transmitting active node.

24. (Cancelled)

* * *

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.